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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/080,507	02/22/2002	Jae Chang Jung	00939B-068710US	1185
20350	7590	03/07/2005	EXAMINER	
TOWNSEND AND TOWNSEND AND CREW, LLP TWO EMBARCADERO CENTER EIGHTH FLOOR SAN FRANCISCO, CA 94111-3834			LEE, SIN J	
			ART UNIT	PAPER NUMBER
			1752	

DATE MAILED: 03/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/080,507	<b>Applicant(s)</b> JUNG ET AL.	
	<b>Examiner</b> Sin J. Lee	<b>Art Unit</b> 1752	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 December 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 3-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 09/465,111.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. In view of the amendment of December 2, 2004, previous 102(e) rejection on claims 1-3 and 5-19 over Lee et al'707, previous 103(a) rejection on claims 20 and 21 over Lee et al'707, and previous double patenting rejection on claims 1-3, 11-13, and 20 over U.S. Pat.707 are hereby withdrawn since the polymer of Lee et al'707 is required to have the silicon-rich monomer unit, which gives the polymer excellent etching resistance to oxygen.

2. Due to newly cited prior arts, the following rejections are made non-final.

#### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

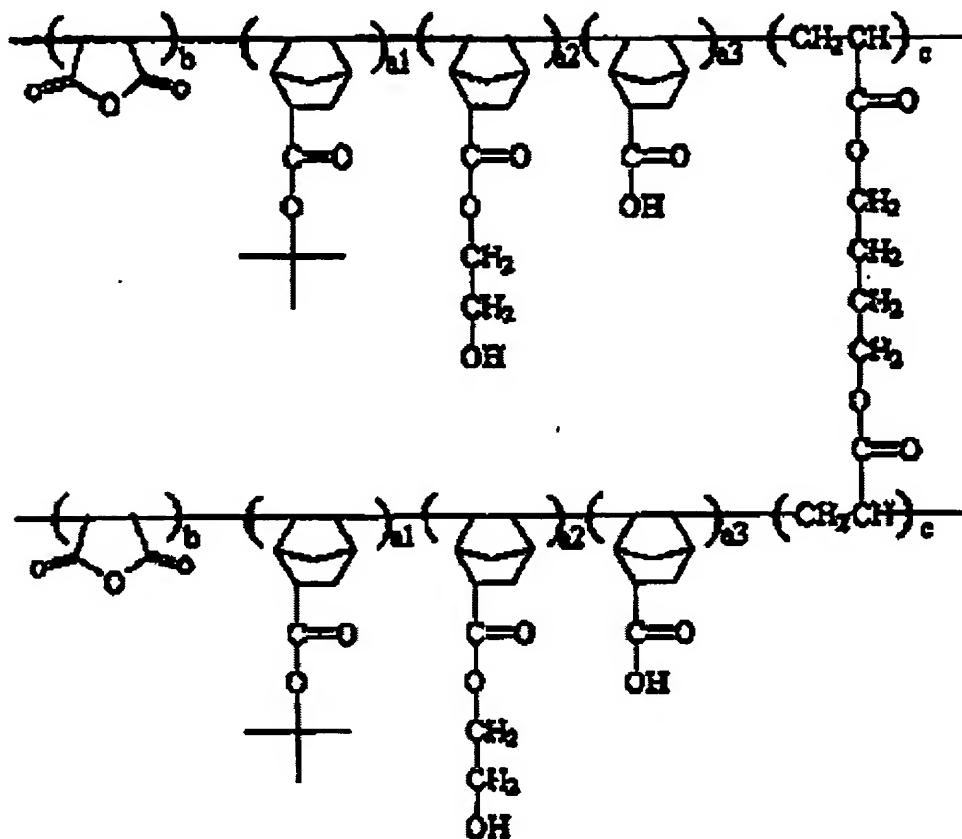
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1 and 3-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Jung et al (GB 2 345 286 A).

In Example 2 (see pg.11 and 12) Jung teaches the synthesis of poly(maleic anhydride/2-hydroxyethyl 5-norbornene-2-carboxylate/tert-butyl 5-norbornene-2-carboxylate/5-norbornene-2-carboxylic acid/1,4-butanediol diacrylate), which structure is shown below:

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The molar ratio  $a1 : a2 : a3 : b : c$  is 0.405 : 0.048 : 0.024 : 0.476 : 0.047.

This polymer is exactly the same as that of present Example 2, and it teaches present inventions of claims 1, 3-10, 20, and 21 (it is the Examiner's position that the presence of the monomer units "a1" and "a3" shown above does not materially affect the basic and novel characteristic(s) of the claimed invention because those monomer units are also included in the polymer made in present Example 2).

In Example 4, Jung dissolves his polymer in an organic solvent together with triphenylsulfonium triflate (a photoacid generator). The photoresist composition thus prepared is spin-coated on a silicon wafer and soft-baked at 110°C. Then, after

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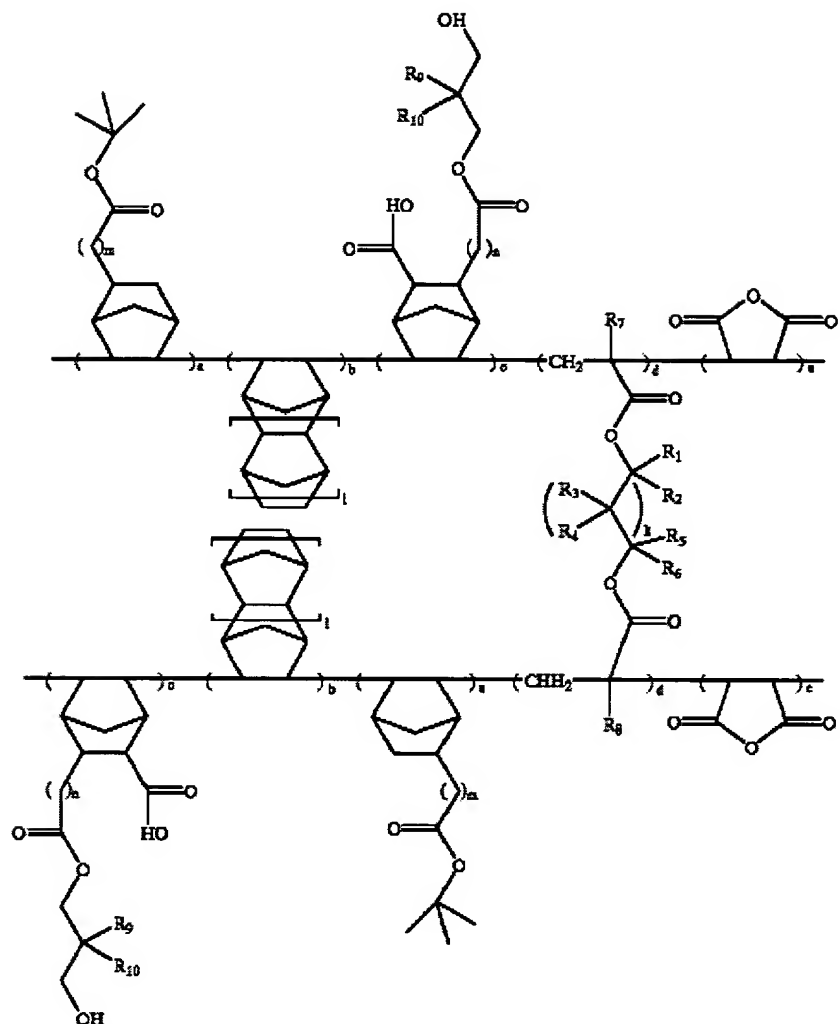
irradiating using ArF laser exposers, the wafer is post-baked at 110°C, and it is developed in TMAH solution to obtain a L/S pattern. Thus, the prior art teaches present inventions of claims 11-19.

6. Claims 1, 3 and 11-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Lee et al (6,403,281 B1).

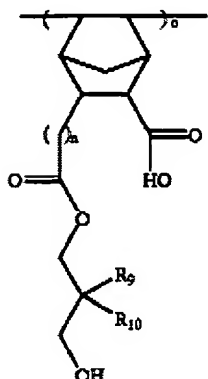
The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Lee teaches (col.6, lines 18-67, col.7, lines 48-53) the following polymer of the formula 10 as one of the two preferred photoresist polymers of his invention:

10



As shown above, Lee's polymer contains *two* of the following repeating unit;



in which  $n$  is an integer from 0-2, and  $R_9$  and  $R_{10}$  are H, or linear or branched  $C_1$ - $C_5$  alkyl. Based on this teaching, one of ordinary skill in the art would immediately envisage the repeating unit shown above in which  $n$  is 0, and both of  $R_9$  and  $R_{10}$  are H (because there are only several choices given for the variables  $n$ ,  $R_9$  and  $R_{10}$ ). The monomer which forms such repeating unit teaches present monomer of Chemical Formula 4 of claim 1: present  $k$  would be 1;  $p$  would be 0;  $R_5$  would be H;  $R_2$  and  $R_3$  would be H atoms;  $R_4$  would be a straight  $C_1$  carboxylic acid; and  $R_1$  would be a straight  $C_4$  ester including one hydroxyl group. Therefore, Lee teaches present component (a) two alicyclic olefin derivatives of the Chemical Formula 4 in present claim 1.

Lee teaches that  $R_1$ - $R_6$  in the repeating unit "d" in his polymer (as shown above) can independently be H, or linear or branched  $C_1$ - $C_5$  alkyl group. Therefore, one of ordinary skill in the art would immediately envisage all of  $R_1$ - $R_6$  to be H atoms (because there are only several choices given for the variables  $R_1$ - $R_6$ ). The monomer which forms such repeating unit teaches present crosslinking monomer of the formula shown in present claim 1: present  $m$  would be an integer of 1, and present  $R$  would be a straight  $C_3$  alkyl group. Therefore, Lee teaches present component (b) of claim 1.

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Lee's polymer shown above also includes the maleic anhydride repeating unit.

Therefore, Lee teaches present invention of claim 1 (*although Lee's polymer shown above does include the monomer unit of norbornene or tetracyclododecene, it is the Examiner's position that presence of such monomer units would not materially affect the basic and novel characteristic(s) of the claimed invention as those monomer units were originally encompassed in the parent application (09/465,111). Also, the monomer unit of t-butyl 5-norbornene-2-carboxylate would not materially affect the basic and novel characteristic(s) of the claimed invention as such monomer unit is also included in the present polymer of Example 2).*

With respect to present claim 3, Lee teaches that in his photoresist copolymer shown above, the repeating unit "c" can be present in 1-30 mol%, the repeating unit "e" can be present in 10-50 mol %, the repeating unit "d" can be present in 0.1-48 mol%. Based on this teaching, one of ordinary skill in the art would immediately envisage the repeating unit "c" to be present in 1 mol% (because 1 mol % is included as the lower end of the taught range), the repeating unit "e" to be present 10 mol% (because 10 mol% is included as the lower end of the taught range), and the repeating unit "d" to be present in 0.1 mol% (because 0.1 mol% is included as the lower end of the taught range). Since these numbers fall within the present ranges of claim 3, Lee teaches present invention of claim 3.

With respect to present claims 11-13, Lee teaches (col.9, lines 51-65) a photoresist composition comprising his photoresist polymer, an organic solvent, and a photoacid generator, and the examples for the photoacid generator given by Lee in



col.9, lines 54-65 are the same as those listed in present claim 13. Therefore, Lee teaches present inventions of claims 11-13.

With respect to present claims 14-18, Lee teaches (col.10, lines 28-48) a process for forming a photoresist pattern comprising the steps of (a) coating a photoresist composition on a substrate of a semiconductor element to form a photoresist film, (b) exposing the photoresist film to light using a light source such as ArF, KrF, EUV, VUV, E-beam, X-ray and ion beam, and (c) developing the exposed photoresist film using an aqueous solution of TMAH. Lee furthermore teaches that preferably, a baking step before and/or after the exposure step is performed at temperature in the range of 70-200°C. Therefore, Lee teaches present inventions of claims 14-18.

Lee also teaches (col.10, lines 48-51) a semiconductor device which is manufactured using his photoresist composition. Therefore, Lee also teaches present invention of claim 19.

### ***Claim Rejections - 35 USC § 103***

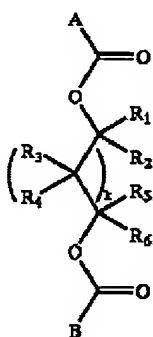
7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al (6,403,281 B1).

As explained in Paragraph 6 above, Lee's polymer includes present two alicyclic monomer units and present maleic anhydride units of claims 20 and 21 (*as explained above, although Lee's polymer shown above does include the monomer unit of norbornene or tetracyclododecene, it is the Examiner's position that presence of such*

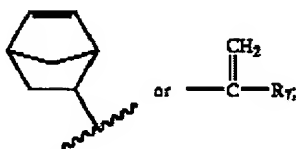
*monomer units would not materially affect the basic and novel characteristic(s) of the claimed invention as those monomer units were originally encompassed in the parent application (09/465,111)).*

As to the present cross-linking monomer comprising 1,3-butanediol diacrylate or 1,4-butanediol diacrylate, Lee teaches a crosslinker monomer of the following formula

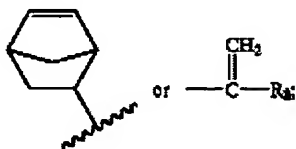


where

A is a moiety of the formula



**B is a moiety of the formula**



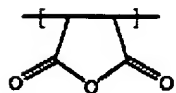
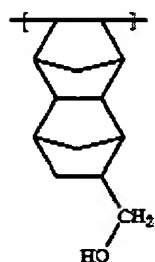
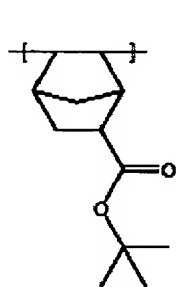
Lee furthermore teaches that R<sub>7</sub> and R<sub>8</sub> are preferably H or CH<sub>3</sub>; R<sub>1</sub>-R<sub>6</sub> independently represents H, or linear or branched C<sub>1</sub>-C<sub>5</sub> alkyl group, and that k is an integer from 0 to 3. Based on Lee's teaching, it would have been obvious to choose Lee's crosslinker monomer of the formula shown above in which A and B both are moiety of the formula –

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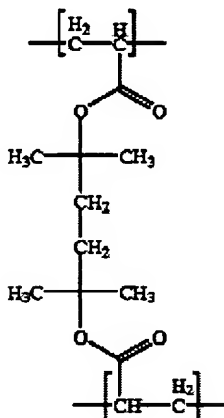
C(=CH<sub>2</sub>)-H, k is 2, and R<sub>1</sub>-R<sub>6</sub> are all H atoms (*in which case, the monomer would be the presently claimed 1,4-butanediol diacrylate*) with a reasonable expectation of obtaining photoresist composition having improved pattern profile, enhanced adhesiveness, excellent resolution, sensitivity, durability and reproducibility. Therefore, Lee's teaching would render obvious present inventions of claims 20 and 21.

9. Claims 1, 3, and 5-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kajita et al (US 6,180,316 B1).

In Synthesis Example 14, Kajita synthesizes a polymer having the following monomer units:



(27-4)



Kajita furthermore teaches the equivalence of the monomer unit (27-2) and the monomer unit of 5-(2-hydroxyethyl)oxycarbonylbicyclo[2.2.1]hept-2-ene (see col.12, lines 11 and 67), the latter being the same as the present monomer unit of 2-hydroxyethyl-5-norbornene-2-carboxylate (present  $\text{R}_2$  being the  $\text{C}_2$  ester including one hydroxyl group), which is used in present Example 2. Based on Kajita's teaching, it would have been obvious to one of ordinary skill in the art to replace the monomer unit (27-2) with the monomer unit of 5-(2-hydroxyethyl)oxycarbonylbicyclo[2.2.1]hept-2-ene because the prior art teaches the equivalence of those two monomer units. Therefore, Kajita's teaching would render obvious present inventions of claims 1, 3, 5, and 10 (the presence of the monomer unit of (27-1) in Kajita's polymer would not materially affect the basic and novel characteristic(s) of the claimed invention because the same monomer unit is also included in the polymer made in present Example 2).

With respect to present claims 6-8, Kajita states in his Synthesis Example 14 that the synthesis was carried out in the same manner as in Synthesis Example 3, and

Synthesis Example 3 was carried out in a nitrogen stream at 70°C. Therefore, Kajita's teaching would render obvious present inventions of claims 6-8.

Although Kajita uses butyl acetate as the solvent for the polymerization in his Synthesis Example 14, Kajita uses the equivalence of butyl acetate and the presently claimed benzene or toluene (see col.25, lines 11-22). Therefore, it would have been obvious to one of ordinary skill in the art to use benzene as the solvent in Kajita's Synthesis Example 14 because the prior art teaches the equivalence of those two solvents. Therefore, Kajita's teaching would render obvious present invention of claim 9.

Kajita teaches (see col.50, lines 1-18) spin-coating his composition (which contains an acid generator such as triphenylsulfonium trifluoromethanesulfonate – see col.48, lines 50-65) solution (in an organic solvent) onto a silicon wafer and pre-baking it (at 125-140°C) to obtain a resist film. The resist film is then exposed to ArF laser. The exposed resist film is then post-baked (at 130-145°C) and developed in TMAH solution to obtain a positive resist pattern. Therefore, Kajita's teaching would render obvious present inventions of claims 11-19.

### ***Double Patenting***

10. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double

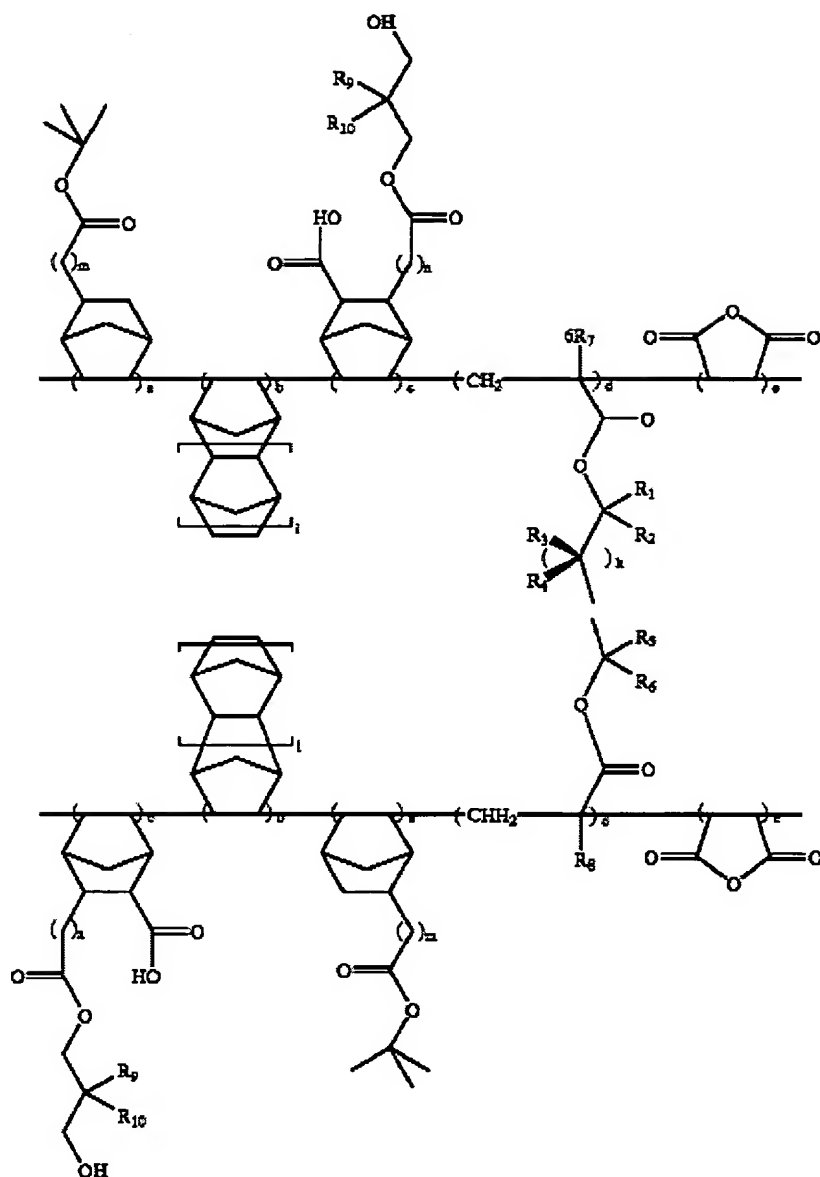
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patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

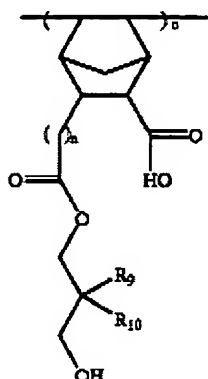
Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

11. Claims 1, 3, 11-17, and 19-21 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 4-8, 10, 12, 16-19, and 21 of U.S. Patent No. 6,403,281 B1. Although the conflicting claims are not identical, they are not patentably distinct from each other because of the following reasons: Claim 4 of Pat.'281 teaches the following photoresist copolymer;

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The polymer shown above contains two of the following repeating unit;



in which  $n$  is an integer from 0-2, and  $R_9$  and  $R_{10}$  are H, or linear or branched  $C_1$ - $C_5$  alkyl. Based on this teaching, it would have been obvious to one of ordinary skill in the art to obtain the repeating unit shown above in which  $n$  is 0, and both of  $R_9$  and  $R_{10}$  are H (because there are only several choices given for the variables  $n$ ,  $R_9$  and  $R_{10}$ ) with a reasonable expectation of obtaining the photoresist copolymer of claim 4 of Pat.'281. The monomer which forms such repeating unit teaches present monomer of Chemical Formula 4 of claim 1: present  $k$  would be 1;  $p$  would be 0;  $R_5$  would be H;  $R_2$  and  $R_3$  would be H atoms;  $R_4$  would be a straight  $C_1$  carboxylic acid; and  $R_1$  would be a straight  $C_4$  ester including one hydroxyl group. Therefore, claim 4 of Pat.'281 renders obvious the present component (a) two alicyclic olefin derivatives of the Chemical Formula 4 in present claim 1. Claim 4 of Pat.'281 also teaches that  $R_1$ - $R_6$  in the repeating unit "d" in the polymer (as shown above) can independently be H, or linear or branched  $C_1$ - $C_5$  alkyl group. Therefore, it would have been obvious to one of ordinary skill in the art to choose all of  $R_1$ - $R_6$  to be H atoms (because there are only several choices given for the variables  $R_1$ - $R_6$ ) with a reasonable expectation of obtaining the photoresist copolymer of claim 4 of Pat.'281. The monomer which forms such repeating unit teaches present



crosslinking monomer of the formula shown in present claim 1: present m would be an integer of 1, and present R would be a straight C<sub>3</sub> alkyl group. Therefore, claim 4 of Pat.'281 renders obvious present component (b) of claim 1. The polymer shown above also includes the maleic anhydride repeating unit. Therefore, Pat.'281 teaches present invention of claim 1 (*although the polymer shown above does include the monomer unit of norbornene or tetracyclododecene, it is the Examiner's position that presence of such monomer units would not materially affect the basic and novel characteristic(s) of the claimed invention as those monomer units were encompassed in the parent application (09/465,111). Also, the monomer unit of t-butyl 5-norbornene-2-carboxylate would not materially affect the basic and novel characteristic(s) of the claimed invention as such monomer unit is also included in the present polymer of Example 2).*

With respect to present claim 3, claim 4 of Pat.'281 teaches that in the photoresist copolymer shown above, the repeating unit "c" can be present in 1-30 mol%, the repeating unit "e" can be present in 10-50 mol %, the repeating unit "d" can be present in 0.1-48 mol%. Since these numbers overlap with the present ranges of claim 3, claim 4 of Pat.'281 would render obvious present invention of claim 3. In the case "where the [claimed] ranges overlap or lie inside ranges disclosed by the prior art," a *prima facie* case of obviousness would exist which may be overcome by a showing of unexpected results, In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

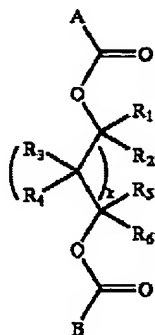
With respect to present claims 11-13, claims 10 and 12 of Pat.'281 teach a photoresist composition comprising the photoresist polymer, an organic solvent, and a photoacid generator, and the examples for the photoacid generator given in claim 12 of

Pat.'281 are the same as those listed in present claim 13. Therefore, Pat.'281 renders obvious present inventions of claims 11-13.

With respect to present claims 14-17, claims 16 and 19 of Pat.'281 teach a process for forming a photoresist pattern comprising the steps of (a) coating a photoresist composition on a substrate of a semiconductor element to form a photoresist film, (b) exposing the photoresist film to light using a light source such as ArF, KrF, EUV, VUV, E-beam, X-ray and ion beam, and (c) developing the exposed photoresist film. Claims 17 and 18 of Pat.'281 furthermore teaches that a baking step before and/or after the exposure step is performed at temperature in the range of 70-200°C. Therefore, Pat.'281 renders obvious present inventions of claims 14-17.

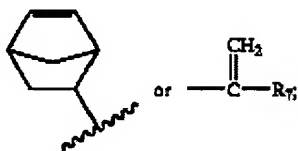
Claim 21 of Pat.'281 teaches a semiconductor device which is manufactured using his photoresist composition. Therefore, Pat.'281 also renders obvious present invention of claim 19.

With respect to present claims 20 and 21, as described above, Pat.'281 teaches present alicyclic olefin derivatives of claims 20 and 21 and present maleic anhydride units of claims 20 and 21. As to the present cross-linking monomer comprising 1,3-butanediol diacrylate or 1,4-butanediol diacrylate, claim 1 of Pat.'281 teaches a crosslinker monomer of the following formula

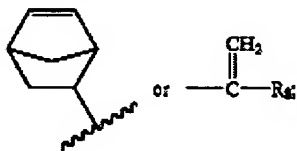


where

A is a moiety of the formula



B is a moiety of the formula



Claim 1 of Pat.'281 furthermore teaches that  $R_7$  and  $R_8$  can be H or linear or branched  $C_1$ - $C_5$  alkyl group;  $R_1$ - $R_6$  independently represent H, or linear or branched  $C_1$ - $C_5$  alkyl group, and that  $k$  is an integer from 0 to 3. Based on this teaching, it would have been obvious to choose the crosslinker monomer of the formula shown above in which A and B both are moiety of the formula  $-C(=CH_2)-H$ ,  $k$  is 2, and  $R_1$ - $R_6$  are all H atoms (*in which case, the monomer would be the presently claimed 1,4-butanediol diacrylate*) with a reasonable expectation of obtaining the photoresist polymer of claim 1 of Pat.'281. Therefore, the teaching of Pat.'281 would render obvious present inventions of claims 20 and 21.

***Response to Arguments***

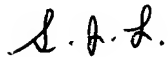
12. Applicants traverse present rejection over Lee'281 by arguing that claim 1 is amended to include the limitation that each of the alicyclic monomers that are present in the polymer are of the formula in which all of R<sub>1</sub>-R<sub>4</sub> do not represent H at the same time and that the polymer of Lee'281 includes a monomer unit of norbornene or tetracyclododecene, which is now excluded by the claim language "consisting essentially of". However, first of all, present claim 1 as amended is *not* saying that each of the alicyclic monomers *that are present in the polymer* are of the formula in which all of R<sub>1</sub>-R<sub>4</sub> do not represent H at the same time. It is only saying that each of the alicyclic *monomer units (a)* has the formula in which all of R<sub>1</sub>-R<sub>4</sub> do not represent H at the same time. Secondly, as already stated above, it is the Examiner's position that presence of monomer unit of norbornene or tetracyclododecene would not materially affect the basic and novel characteristic(s) of the claimed invention as those monomer units were originally encompassed in the parent application (09/465,111) (see <chemical formula 4> pg.5 of the specification of 09/465,111 where it is indicated that all of R<sub>1</sub>-R<sub>4</sub> *can* be H atoms).

For these reasons, present rejections over Lee'281 still stand.

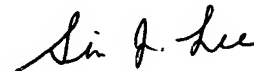
13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is 571-272-1333. The examiner can normally be reached on Monday-Friday from 9:00 am EST to 5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly, can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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March 6, 2005



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